

Civil Engineering Technical Requirement

CIVIL-SR-008

PROTECTION SCREENS

Revision: 3

Updated: 13/01/2017

© Queensland Rail 2017

Reproduction by any means (including electronic, mechanical, photocopying, microcopying or otherwise), except for the purposes permitted by the Copyright Act, is prohibited without prior written permission of Queensland Rail.

This publication has been created for use in the design, construction, maintenance and operation of Queensland Rail infrastructure and infrastructure owned by others that adjoins Queensland Rail's operational corridors. Every effort has been made to ensure that the information contained in this document is correct at the time of authorisation for issue. It is the responsibility of the user to ensure that the information is interpreted correctly and is up to date before it is applied. It is strongly recommended that the user consults with Queensland Rail to ensure relevancy for the specific circumstance and correct interpretation.

When the document is used in other than Queensland Rail projects, Queensland Rail gives no warranties as to the completeness; accuracy or adequacy of the publication or any parts of it and accepts no responsibility or liability upon any basis whatsoever.

| Document Information | | |
|--------------------------|---|---------------------|
| Current Revision: | 3 | |
| First Released: | 22/12/2009 | |
| Last Updated: | 13/01/2017 | |
| Review Before: | 13/01/2022 | |
| Reviewed by: | Christopher Woodgate , RPEQ No: 08897 Manager Track, Civil & Structural Engineering | Date: 05/01/2017 |
| Reviewed by: | Joe Percy , RPEQ No: 08958 Principal Engineer Traction Distribution | Date: 06/01/2017 |
| Endorsed by: | Francisco Siliezar , RPEQ No: 08967 Electrical Discipline Head | Date: 09/01/2017 |
| Endorsed by: | Gary Smith , RPEQ No: 15997 Manager Special Projects, Track and Structures | Date: 12/01/2017 |
| Endorsed by: | William Bolton Discipline Head Track and Structures | Date: 11/01/2017 |

| Document Amendment History | | | |
|----------------------------|------------|--------------------|---|
| Revision | Date | Section(s) Amended | Summary of Amendment |
| Initial | 22/12/2009 | | |
| A | 30/09/2010 | | Rebranded with new disclaimer |
| B | 30/05/2011 | | MCE replaced with CIVIL |
| 3 | 13/01/2017 | | Clarification on definitions Additional information on general design requirements Clarification on the aperture opening sizes for anti-throw and electrification screens Section 9.0 updated Additional screen material selection inserted to appendix |

TABLE OF CONTENTS

| | Page |
|--|------|
| 1.0 INTRODUCTION..... | 3 |
| 2.0 DEFINITIONS..... | 3 |
| 3.0 SCOPE..... | 3 |
| 4.0 GENERAL REQUIREMENTS FOR PROTECTION SCREENS..... | 3 |
| 4.1 ELECTRIFICATION SCREENS..... | 3 |
| 4.2 ANTI-THROW SCREENS..... | 4 |
| 5.0 SCREENS ON OVERBRIDGES AND FOOTBRIDGES..... | 4 |
| 5.1 ELECTRIFICATION SCREENS..... | 4 |
| 5.2 ANTI-THROW SCREENS..... | 4 |
| 6.0 SCREENS ON STAIRS / RAMPS..... | 4 |
| 6.1 ELECTRIFICATION SCREENS..... | 4 |
| 6.2 ANTI-THROW SCREENS..... | 4 |
| 7.0 SCREENS ON RETAINING WALLS / WING WALLS / EMBANKMENTS..... | 4 |
| 7.1 ELECTRIFICATION SCREENS..... | 4 |
| 7.2 ANTI-THROW SCREENS..... | 4 |
| 8.0 SCREENS ON OR NEAR CORRIDOR BOUNDARY..... | 5 |
| 9.0 SCREENS FOR BUILDINGS OVER OR CLOSE TO QUEENSLAND RAIL CORRIDOR..... | 5 |
| 10.0 SCREENS PROTECTING LIVE OHLE FROM CONSTRUCTION WORKS..... | 5 |
| 11.0 FURTHER INFORMATION..... | 5 |
| APPENDIX A: ELECTRIFICATION MATERIAL REQUIREMENTS..... | 6 |
| APPENDIX B: SCREEN CLEARANCES..... | 7 |

1.0 INTRODUCTION

This Technical Requirement details the criteria which must be met by providing electrification and anti-throw screens, called protection screens.

A Protection screen may be required to perform both functions of electrification and anti-throw screening. Electrification screens are positioned adjacent to live components of the overhead line equipment (OHLE) to protect personnel and members of the public from electrocution. Anti-throw screens are located adjacent to railway infrastructure to prevent injury and damage from objects being thrown at tracks, trains, platforms and other infrastructure.

This document describes situations and locations requiring protection screens, and the requirements for these screens.

Reference is made to the following additional Queensland Rail Technical Requirement which must also be satisfied:

- CIVIL-SR-007 *Design and Selection Criteria for Road/Rail Interface Barriers*

All reference documents, e.g. Australian Standards, codes and Queensland Rail Technical Requirements, are to be the latest version.

2.0 DEFINITIONS

OHLE: Overhead Line Equipment which includes any live energised components such as the contact, catenary, return conductor and any other live equipment.

Overbridge: An Overbridge includes all road or air-space development bridges spanning across the rail corridor.

Footbridge: A bridge designed solely for pedestrian traffic (including cyclists), and may be accessed either by lifts, stairs, ramps or escalators.

Live (Alive): Energised or subject to hazardous induced or capacitive voltages. When a potential difference (voltages) exists, or could exist, between an object and earth. For example: contact wires, feeder wires and transformer bushings.

Public: These people may either be customers of Queensland Rail, or other non-commuter users of the overbridge or footbridge.

Protection Screens: Refers to either electrification or anti-throw screens.

Standing Surface: Any point on a surface where a person may stand or walk about without great effort.

3.0 SCOPE

This Technical Requirement applies to protection screens constructed by or in liaison with Queensland Rail, for developments adjacent to or in close proximity to Queensland Rail property, to protect Queensland Rail infrastructure and assure public safety. This Technical Requirement applies to the design of new structures, and upgrading or modifications of existing structures.

4.0 GENERAL REQUIREMENTS FOR PROTECTION SCREENS

Structural design must be performed in accordance with the relevant Australian Standards.

All screens within 3 metres of the live OHLE must be electrically bonded, and designs must be submitted to Queensland Rail for approval.

All screens must be built to prevent climbing up the pedestrian side. Return screens are required for a minimum distance of 3 metres, at any screen end that may be accessible to the public, to prevent climbing onto the back.

Protection screens are to be constructed, so that they can withstand vandalism **without structural failure, or loss of protection integrity**. Screen material must not be easily disfigured by scratching with sharp implements.

For footbridges:

- the preferred option is to have the walking area enclosed,
- All screens must be able to be removed and cleaned from the inside of walkway or stair.
- In addition for safety and security reasons the protection screen must have sufficient transparency when viewed through the screen at different angles.

For the purposes of this document the dimensions are measured from live OHLE equipment.

4.1 ELECTRIFICATION SCREENS

If a screen is to provide electrification protection, any perforations in screens, or gaps in fixings between members must be less than 8 mm x 8 mm, except where noted otherwise in this document. Gaps between supporting frames may need to be closed off by providing compressible packing material.

Electrification Safety Sign (Drawing - 148/854/A3) must be placed on the screens in close proximity of the live OHLE.

Water or other liquid jet hoses must not be used on electrification screens for cleaning purposes without

a full isolation of the live OHLE arranged through Queensland Rail.

See Appendix A for examples of suitable electrification screen materials.

In addition to electrification screens, anti throw protection is often required. In these instances, the electrification screens may be extended higher and used as anti throw screens.

4.2 ANTI-THROW SCREENS

Anti throw screens must extend 2.4 metres vertically above the highest toe hold (usually the handrail) if see-through, or 2 metres if non see-through. Expanded metal is considered see-through.

Anti-throw screens must not have openings greater than 25 mm x 25 mm.

For screens on buildings within the limits set out in Clause 9, acceptable openings on screens shall be restricted to a maximum opening not exceeding 80mm in any direction.

5.0 SCREENS ON OVERBRIDGES AND FOOTBRIDGES

5.1 ELECTRIFICATION SCREENS

Electrification screens are required on all footbridges over electrified track. This screen must extend at least 3 metres horizontally either side of any live OHLE infrastructure, measured perpendicular to the track.

Electrification screens are required to extend vertically a minimum 1.8 m above the highest standing surface or a foothold (usually handrails).

If electrification screen perforations are larger than 3.5 mm x 3.5 mm, and the bridge clearance above conductors is less than 2 metres, extra protection is required. Extra protection options include:

- Designing the bottom 1 metre of the screen to be solid (no perforations), or
- Installing a hood above the overhead wires, extending at least 1 metre away from the bridge (measured perpendicular to the bridge) and 1 metre horizontally in each direction from the live OHLE wiring.

The hood must be designed to dissipate any liquid stream.

5.2 ANTI-THROW SCREENS

Anti-throw screens are mandatory on all bridges. The length of anti throw screens must be adequate to inhibit throwing of objects onto tracks, platforms, and other railway infrastructure and is to be determined on a case by case basis and approved by the Rail Infrastructure Manager.

The height of the anti-throw screens is to be in accordance with Clause 4.2.

For more details, see Appendix B, Figure 1.

Refer to CIVIL-SR-007 *Design and Selection Criteria for Road/Rail Interface Barriers*, for height details of screens on top of crash barriers.

6.0 SCREENS ON STAIRS / RAMPS

6.1 ELECTRIFICATION SCREENS

Electrification screens are required on stairs and ramps within 3 metres horizontally of live OHLE infrastructure.

The electrification screen must extend vertically a minimum 1.8 metres above the highest foothold (usually hand rails).

The screen must extend from the platform level, or ground level, all the way to the top of the stairs / ramp.

If the screen is within 1.5 metres horizontally of the conductor, it must not have perforations larger than 3.5 mm x 3.5 mm.

6.2 ANTI-THROW SCREENS

The extent of anti-throw screens is to be determined on a case by case basis and approved by the Rail Infrastructure Manager.

The height of the anti-throw screens is to be in accordance with Clause 4.2.

See Appendix B, Figure 1 for more details.

7.0 SCREENS ON RETAINING WALLS / WING WALLS / EMBANKMENTS

7.1 ELECTRIFICATION SCREENS

Electrification screens are required on retaining walls, wing walls and other significant embankments within 3 metres horizontally of live OHLE. The screen must extend at least 3 metres horizontally either side of the live OHLE.

Electrification screens are required to extend vertically a minimum 1.8 metres above the highest standing surface or a foothold (usually handrails).

7.2 ANTI-THROW SCREENS

The extent of anti-throw screens is to be determined on a case by case basis and approved by the Rail Infrastructure Manager. See Appendix B, Figure 2 for more details.

8.0 SCREENS ON OR NEAR CORRIDOR BOUNDARY

Protection screens may be required on or near the corridor boundary.

Electrification screens are required if the corridor boundary is within 3 metres of live OHLE (see Appendix B, Figure 3).

Anti-throw screens may be required if members of the public could easily throw objects from outside of the corridor onto tracks / platforms / other infrastructure. The extent of anti-throw screens is to be determined on a case by case basis and approved by the Rail Infrastructure Manager.

9.0 SCREENS FOR BUILDINGS OVER OR CLOSE TO QUEENSLAND RAIL CORRIDOR

Protection screens may be required for buildings closer than 20 metres from the centreline of closest track or within 10 metres of the Queensland Rail property boundary. For any structures within these limits, the designer must assess the safety risk to the railway to determine the extent of the protection required, and obtain the approval of the Rail Infrastructure Manager.

The design of balconies and windows shall mitigate the risk of objects being thrown onto railway infrastructure.

Throw protection measures should be considered where opening windows, doors, balconies or other areas afford the opportunity for objects to be thrown onto a railway. The following factors may influence the need for throw protection:

- location and position of communal and private open space in relation to the railway, for example balconies, decks and terraces
- presence of physical barriers, such as boundary and courtyard fencing, which may provide protection for certain building levels, depending on the height of the barrier, topography of the area and finished development levels
- use of rooms with which windows are associated, for example, bathroom and bedroom windows in contrast with living room windows
- height (number of storeys) of the development and the number of windows and balconies facing the railway, for example, a house versus a medium to high rise apartment building
- design of windows and balconies in relation to the railway, for example, the use of awning windows, security screens, louvres and transparent (glass) balcony screens and podium barriers that provide throw protection

- proximity to train stations
- existence and setback of OHLE from the railway

A variety of architectural treatments of screening designs may achieve anti-throw protection, however the design of such protection would need to ensure it prevented climbing and restricted the ability to throw objects at the railway. The measures to be adopted need to be agreed by Queensland Rail.

10.0 SCREENS PROTECTING LIVE OHLE FROM CONSTRUCTION WORKS

Protection screens may be required where construction and maintenance works occur on or close to Queensland Rail land. These screens should be erected no closer than 3 metres horizontally from the nearest live OHLE equipment, unless otherwise approved by Queensland Rail's Traction Power Engineer. Electrification screens must extend at least 3 metres horizontally past the live electrical equipment that they are shielding.

Requirements for these screens are to be agreed by Queensland Rail's Traction Power Engineer, who will issue a Safety Clarification Advice, if required.

11.0 FURTHER INFORMATION

Further electrical safety information can be obtained from:

- Queensland Rail Safety and Environment Management Systems Standards:
 - MD-10-191 "Electrical Traction Systems Standard" Module 5, Section 3.3 Clearances.
 - MD-10-161 "Fencing and signage of the right of way and electrification infrastructure"
- CIVIL-SR-003 Requirements for Work On or Near High Voltage Overhead Line Equipment and Low Voltage Services

Copies of these documents may be obtained from Queensland Rail where applicable.

All reference documents including Australian Standards, Codes of Practice, Queensland Rail's standards and Queensland Rail Technical Requirements, are to be the latest version.

APPENDIX A: ELECTRIFICATION MATERIAL REQUIREMENTS

Table 1: Screen Suitability – Electrification Screen above live OHLE

| PRODUCT | REQUIRE HOOD |
|------------|--------------|
| CRIMSAFE | NO |
| L7616G | NO |
| RO7962 | YES |
| RO6451 | YES |
| RO3341 | NO |
| SECURE 210 | NO |

Table 2: Screen Suitability – Electrification Screen adjacent to live OHLE.

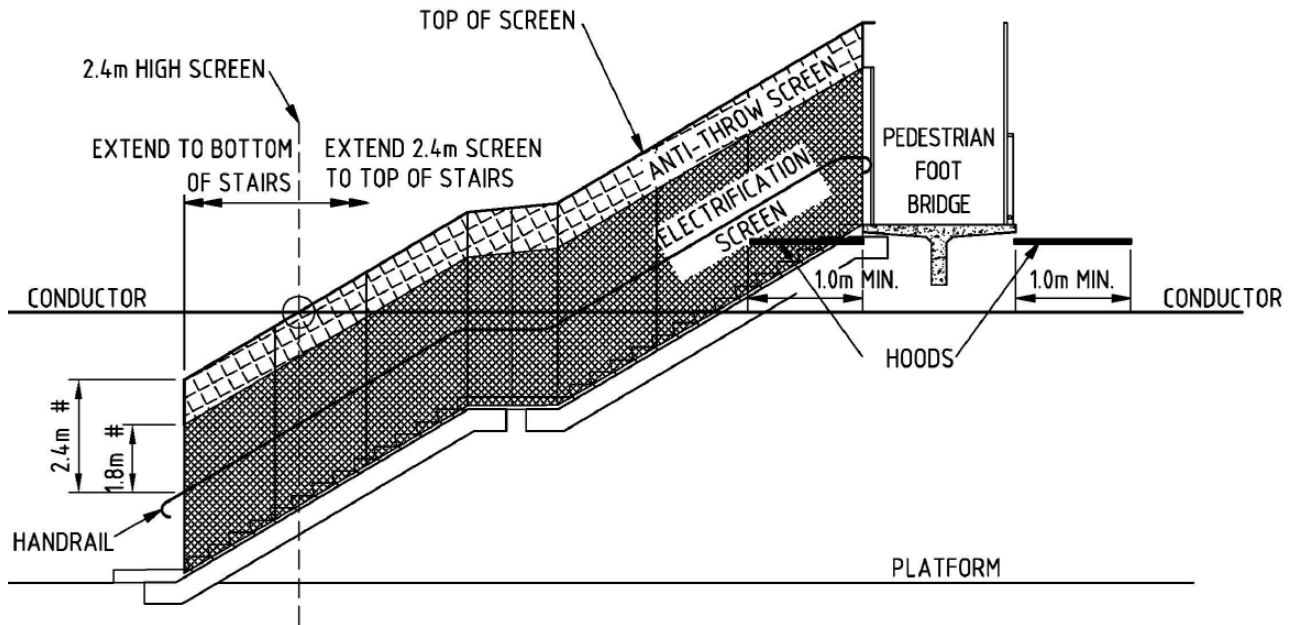
| PRODUCT | HORIZONTAL CLEARANCE |
|------------|----------------------|
| CRIMSAFE | ≥ 1.0m |
| L7616G | ≥ 1.5m |
| RO7962 | ≥ 1.5m |
| RO6451 | ≥ 1.5m |
| RO3341 | ≥ 1.0m |
| SECURE 210 | ≥ 1.0m |

Notes:

1. Refer to Appendix B Figure 1 for definitions of horizontal clearance. For horizontal clearance $\leq 1.0\text{m}$, it is recommended that a solid panel be used.
2. Screens are as listed in the current LOCKER group catalogue. Other type of screens may also be suitable but these need to be assessed and approved by Queensland Rail.
3. For $h \geq 3$ metres, normally there is no requirement for provision of an electrification screen unless specifically advised by Queensland Rail, although anti throw screens may still be necessary. This requirement may apply to structures, including commercial or residential developments adjacent to the railway and for structures adjacent to the railway during construction.

APPENDIX B: SCREEN CLEARANCES

Figure 1: Screens on Stairs / Ramps and Overbridges



EXTENT OF ELECTRIFICATION SCREENS FOR STAIRS/RAMPS (N.T.S.)
DIMENSION TAKEN FROM EXISTING FOOTHOLD

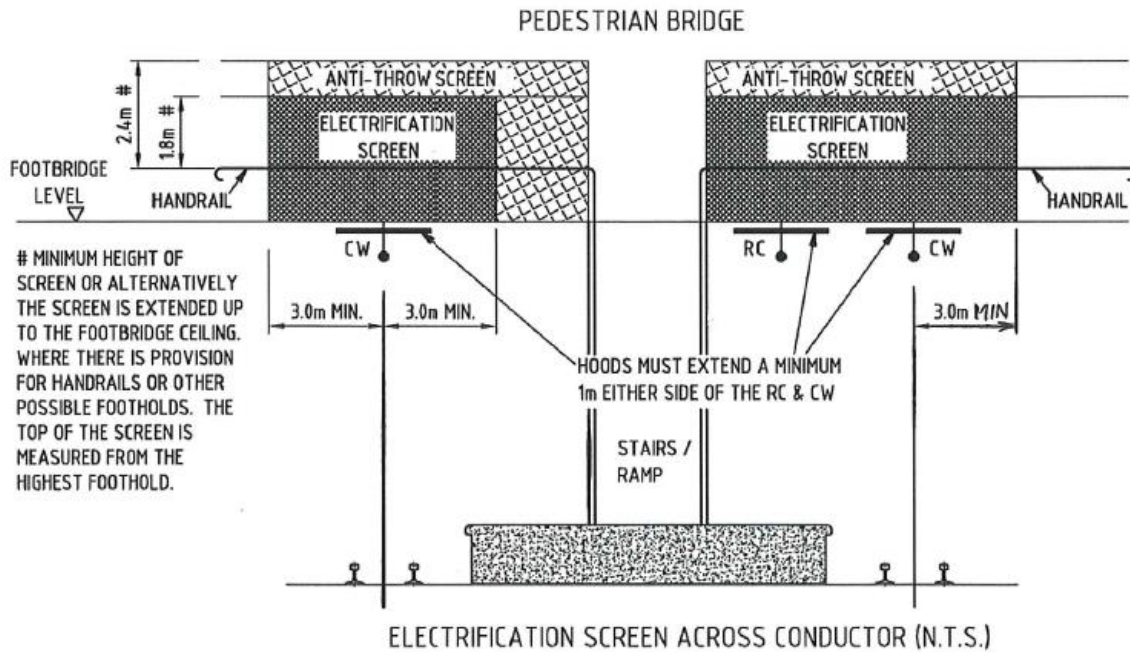
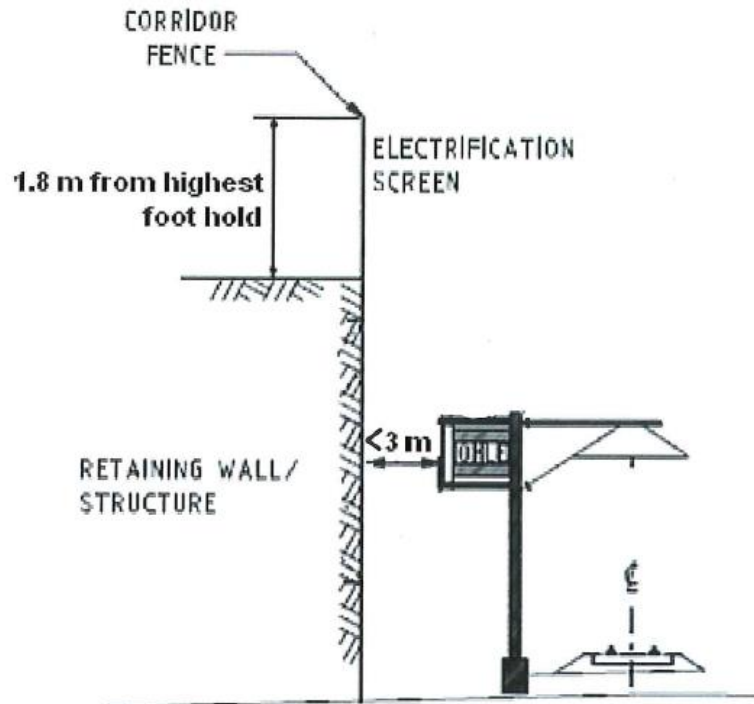
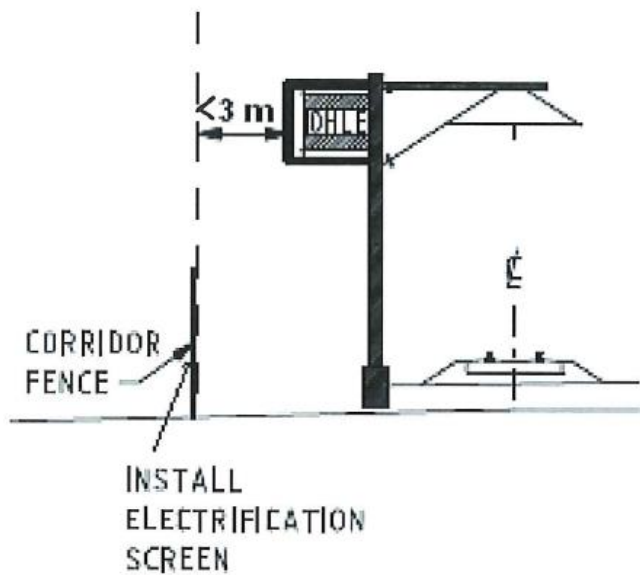


Figure 2: Electrification Screen on structures, on or near corridor boundary (Retaining Walls and Embankments) within 3 m of live OHLE (N.T.S)



Note: Anti Throw Screens may also be required (see Section 7 and 8)

Figure 3: Electrification Screen required if corridor boundary is within 3 m of live OHLE (N.T.S)



Note: Anti Throw Screens may also be required (see Section 7 and 8)